2K22M Tunguska (SA-19 Grison)

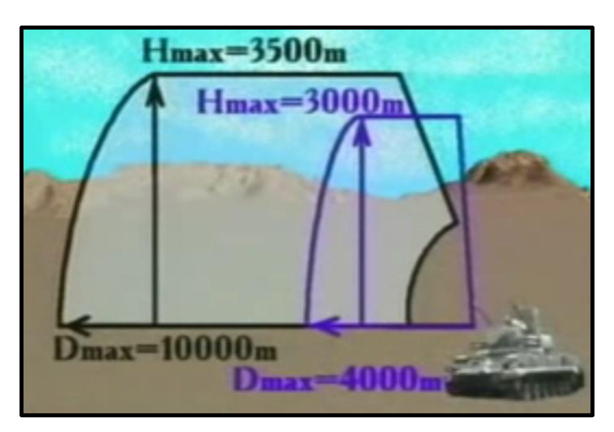


The work on development the successor of the Shilka, 9K33 Strela-1 (SA-9) and 9K35 Strela-10 (SA-13) systems started in 1970 and was not an easy and short program.[1] When the project started the guided anti-tank guided missiles (ATGM) just barely existed which are strongly changed the course of the development. The chassis of new SAM is the GM 352 type, amphibious capability was not demanded even both Strela SHORAD SAMs had such platforms.

The new SAM system had to deal with the A-10A Thunderbolt II attack airplane (with AGM-65 Maverick air to ground missile) as well as helicopters equipped with ATGMs. It the '70s BGM-71 TOW (AH-1 Cobra) and the European HOT I missiles (Gazelle, Bo-105) were the main threats with about 4 km maximal engagement range. Because of the arrival of the AH-64A Apache with AGM-114 Hellfire missile the range of the threat increased to 8 km. The AH-64A was even more dangerous because it has night combat capability. The ZSU-23-4 did not have enough range even against the TOW and HOT I capable helicopters, the Strela-1/10 did not had night time capability.

The 2K22M intended to replace with more than one air defense vehicle type but with smaller quantity. The Soviet regiments (both motorized or armored) had four trela-1/10 and four Shilka but only six Tunguska per regiment was planned.

The design of the 2K22M Tunguska inherited from both the AAA and SAM systems either. Target tracking is possible with radar and TV camera (optical channel) either. The vehicle has its own target acquisition radar which makes it similar to 9K33 Osa with 18 km nominal detection range with minimal 15 m search capability. Neither of the predecessor system had such autonomous target acquisition capability even the Strela-10M had only rangefinder radar, the sector search capability of the ZSU-23-4 was totally limited to the 360 degree scanning dedicated radar. As usual the best option is rely on digital data link target coordinates are supplied by other radars and IADS elements.



Regardless the guided missiles the Tunguska kept the anti-aircraft guns either. While the Shilka had 4x23 mm 2A7 type guns the Tunguska got a pair of 30 mm 2A38 type gun. Thanks to the increased caliber not only the effective range but the destruction power of the gun increased comparing to the Shilka. Maximal range is 4 km up to 3000 meter altitude with maximal 2 km distance (offset) parameter, maximal target speed is 500 m/s. [2]

The main armament of the Tunguska is the eight 9M311M or 9M311-M1 type missiles with radio control guidance similar to older Volkhov or the 9K33 Osa but with different design regarding on electronics, antennas and the maneuverability of the missile. Maximal range is 10 km (with 9M311M is only 8 km) up to

[1] *Is a longer document about the development among the attachments. The original document is in Russian the translation is just a very crude one by the Google Translator.*

[2] *https://youtu.be/KUc8iJ0QvEs?t=1m31s*

3500 meter altitude with maximal 4 km distance (offset) parameter, maximal target speed is 600 m/s.[3] During movement is not possible guide and launch missile, only the guns can be used.

The design of the missile is different from any Soviet SAM system. The missile has two stages but second stage is just a "dart" it does not have rocket engine. The burnout speed of the missile is about 900 m/s the first stage is separated just 2 seconds from the launch. Launch weight of the 9M311M is 57 kg, warhead weight is 9 kg.



The 9M311 missile.

Regardless the AH-64A Apache and other new threat made urgent the appearance of the Tunguska until end of the Cold War only a handful were manufactured just an initial variant. The development of the mass produced 2K22M was finished only after the end of Cold War. Even in 2017 the Tunguska did not fully replaced the Strela-10M family.

Regardless the 2K22M did not fully replaced the Strela-10M family is another possible successor system the Sosna.[4] The basic principle of the Sosna is totally different from both IR guided missiles and the Tunguska. The Sosna is similar to the Sweden RBS-70 which uses laser beam riding guidance while Tunguska uses RCG.

In the chapter of S-300/400 is mentioned the 96K6 Pantsir (SA-22 Greyhound) but the system itself is not described there. Regardless the Pantsir is mobile is not an army air defense system (it does not have ABC protection and any armor) it can be called as upscaled and upgraded version of the 2K22M Tunguska.





The Pantsir-S1 (above left) is designed to protect S-300/400 missile batteries because their fire arc is limited to 105/90 degree which make possible to attack and saturate the defense in case attacking multiple directions is possible. The role of the S-300/400 is area denial and long rage engagement which makes expensive the large missiles. Many times is technically impossible to ensure the self-defense capability of S-300/400 batteries and even it would be it does not mean is economically viable.

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[3] https://youtu.be/KUc8iJ0QvEs?t=1m31s

[4] https://www.youtube.com/watch?v=fQ4enjehMB8 , https://goo.gl/suF4s4

The incoming ARMs, cruise missiles or smaller bombs many times can be detected from less range and because of their speed is enough defeat them from much smaller distance than range of S-300/400 systems. This conception leaded to development of the Pantsir. One S-400 missile battery is (or will be) protected by six Pantsir-S1. The Pantsir has a tracked, self-propelled ABC protected variant but so far nobody has bought any of them not even Russia (on the image above right).

The 57E6 missile of the Pantsir is radio command guided similar to 9M311 but the comparing to single target channel of the 2K22M the Pantsir-S1 has four thanks to the phased array radar on the vehicle. The radar of the Pantsir follows not only the target but as well as the missile similar to S-300. It is possible to guide with radar three missiles on three targets and the usual optical tracking makes possible to track one more target.

The missile is the enlarged variant of the 9M311 the weight is increased to 74 kg, burnout speed is 1300 m/s. The maximal engagement range increased to 20 km maximal target altitude can be 5-15 km depending on the type of the target. The carried missile capacity increased from 8 to 12 comparing to 2K22M.



The 57E6 missile.[5]

1 – proximity fuse, 2 – contact fuse 3 – warhead 4 – explosive filler, 5 – canard actuators, 6 – electronics module, 7 – gyro package, 8 – electric generator, 9 – RF transponder beacon, 10 – optical beacon

[5] http://www.ausairpower.net/APA-96K6-Pantsir-2K22-Tunguska.html